

Keeping research records

Keeping clear documentation, accurate and verifiable research records.

Maintaining good records during the course of research is essential: without an accurate record of a project, a number of potential problems arise. For instance, establishing priority of results, with time-traceable evidence, is impossible without a research record. Likewise, replicating or reproducing research become very difficult if decisions and steps taken during research are not recorded in a systematic and clear way. This latter becomes particularly important if the outcomes, results, or the reliability of the data are challenged by a third party: without documentation to show how data or results were obtained and analysed, it becomes very difficult to prove such challenge to be unfounded. Research records have, therefore, both a positive function *providing support to new ideas emerging in the course of research*, as well as a negative function, *to defend work against challenges or allegations to the rigour or validity of research* that has been conducted, if required. Proper research records are thus central to the integrity of research.

Proper research records, like planning and organisation, are so fundamental to good research that they are often taken for granted. A significant proportion of scientists have indicated, during surveys, that their research records are either inadequate or not complete.

A proper research record should contain:

- Meeting notes of any discussions between researchers involved in the project. If a project is being conducted by an individual researcher, then notes related to departmental or other meetings that have influenced decisions taken on the project, ie: funding or resource allocation; limits on lab or library time; practical difficulties arising from external parties.
- Evidence of any ethical review and of other permissions, such as access rights or criminal record checks, should be kept with the research record pertinent to the data to be gathered and analysed for that project. This is essential if, in the future, a challenge was made regarding the ethics or legality of the data or the project.
- Data collection process and procedures: this should be fully detailed and complete with dates and times for the collection of all data, and details about how the data were obtained. It is *fundamental* to the integrity of research that this record is *original*, without any amendment at a later point, and should therefore *include everything*. This is the area where any problems with fabricated data would be traced, so if you are tempted to *not* record something during data collection, then you should be asking yourself why it is not being recorded. The point of a data collection record is that it is *complete and accurate*. The only condition on completeness of data collection records is that any confidential data should be sufficiently anonymised or protected, depending on the type of data and permissions granted for use of this data, so that only those with the right to access confidential data are able to access via the normal research record. Otherwise, confidential data should be kept separately from generally accessible records, with relevant referencing and links where necessary.
- Data storage information, such as filenames, file formats, and storage locations: back up of data and sharing data with others necessitate consistent data storage protocols, which depend on naming and formats being clear. This is particularly important where data is going to be made available using open access data routes or is required to be deposited in a data archive following the project.
- Data analysis process and procedures: like data collection, the analysis of data is central to the conducting of research. Full details should be recorded providing a documented trail, showing decisions taken, analytic methods used, and initial results *in an un-amended form*. Amended analysis records can be included but as a supplement to original records and never as a replacement. Inclusion of amended analysis without original analysis corrupts the research record sufficiently that any challenge to the integrity of the research becomes

difficult to defend. This is the area where most problems of falsification of data arise.

- Citation reference material if it is relevant to any practical aspect of the research process, such as methodology or analytic techniques, and will form part of the published results, then these should be recorded alongside the relevant aspects of the record.
- Your own ideas during the project should also be captured as this shows where original contributions and justification for various decisions taken during the project were made. Dating these entries can be helpful in establishing priority.

Ideally, the research record should be kept as a single central notebook, whether traditional bound notebook or as an electronic file accessible to all those who need to access the record. Using a permanently bound or stable formatted record is essential, as this provides extra assurance that the timing of events is sequential as dated in the notes and that nothing has been added. Removed pages can also easily be spotted. If electronic files are used, ensuring that “track changes” or review tools are enabled means that any amendments to the record are preserved in the file itself and open to review if required. If further records, such as loose-leaf sheets containing permissions or approvals are needed, these can be affixed to leaves within the notebook or scanned and added to an electronic file.